

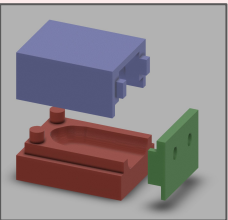
Improving the Manufacturability of an Oral Cancer Diagnosis Training Model

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Need for Early Detection of Oral Cancer

- **450,000+** new cases of oral cancer per year globally
- Low- and middle-income countries have **less access** to high quality care for oral cancer
- Only **29%** of cases are diagnosed in early stage
- Dark spots in autofluorescence imaging confirm presence of lesions
- Physicians are trained using pictures and descriptions (not accurate)
- Correctly distinguishing lesions important in monitoring lesion development

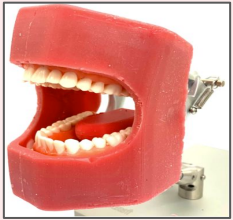


Addressing the Problem

There is currently **no training model** in the market. The only existing prototype is **not standardized**.

- **> 8.1 hours** to make a complete set
- Different lesions require different assembly procedures
- Lesions require time-consuming art rendering

Our solution: Design multi-tongue mold with lesion indents to efficiently produce multiple tongue + lesion models at once



BluNoma's Tongue Model

	Erythroplakia	Leukoplakia	Lichen Planus	Pyogenic Granuloma	Oral Cancer
			White Light		
Our Model					
Patients					
			Autofluorescence		
Our Model					

BluNoma's Tongue and Lesion Mold Prototypes

Lichen Planus Mold Texture

Leukoplakia & Erythroplakia Mold Texture

Oral Cancer Mold Texture

Pyogenic Granuloma Mold Texture

Leukoplakia, Erythroplakia and Lichen Planus Mold

Pyogenic Granuloma and Oral Cancer Mold

Production Assembly Steps

1. Blend the silicone mix for lesion

2. Pour silicone into lesion indent

3. Cure felt in shape of lesion

4. Place felt on top of silicone

5. Blend silicone mix for tongues

6. Pour silicone into mold for tongues

7. Place backing on top of mold into tongues

8. Let silicone cure and remove tongues

Testing Plan and Results

Production Time

Average time of each member to produce one tongue model

Current Model: 8.1 hours
Our Model: 2.0 hours

Accuracy

5-level Likert Scale survey to clinical experts

Lesion	Score
Erythroplakia	3.86
Leukoplakia	3.88
Lichen Planus	3.28
Pyogenic Granuloma	3.86
Oral Cancer	4.00

Assembly Steps

Number of steps from the mixing of silicone to the removal of tongues

Lesion	Previous Model	Team BluNoma
Erythroplakia	11	8
Leukoplakia	11	8
Lichen Planus	11	8
Pyogenic Granuloma	12	8
Oral Cancer	13	8

Material Cost: \$27.80

Our target cost was \$126.57 to be accessible for LMICs

Durability: 5/5

Withstand at least 300 twists, 240 pulls, and 300 palpations without losing quality

Conclusion & Future Work

Conclusion

1. Production time for full model **decreases 4X**
2. Model is **low-cost** and easy to produce
3. Accuracy and durability are maintained

Future work

1. Add lesions to other locations in the oral cavity
2. Improve fluorescence contrast between tongue & lesion
3. Expand model beyond pilot study

References & Acknowledgements

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